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DISTRICT 7
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LOS ANGELES, CA 90012

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File: SR-14 (Wdn) & HDC-(New)
EA: 07-2600U0
Project No. 0712000035
High Desert Corridor (HDC)

From: DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES - MS #18
OFFICE OF GEOTECHNICAL DESIGN SOUTH-1, BRANCH D

Subject: District Preliminary Geotechnical Report for the SR-14 Widening and proposed High Desert Corridor, Los Angeles County Segment, Los Angeles County, California

INTRODUCTION

This District Preliminary Geotechnical Report (DPGR), completed by the Office of Geotechnical Design South 1 (OGDS1), presents preliminary geologic and geotechnical information for the design study of the District 7 Segment of the High Desert Corridor (HDC) in Los Angeles County. The currently proposed alternatives (Alignment Alternatives 2 and 3) for the new HDC alignment extend approximately 63 miles, from State Route 14 near Technology Drive/Avenue P-8 in Palmdale, to join with State Route 18 near Bear Valley Road, just east of Apple Valley. The approximately 29 mile long Los Angeles County Segment of the HDC trends west to east from State Route 14, through and north of Palmdale to the Los Angeles/San Bernardino County line. The location of Districts 7 and 8 HDC preliminary proposed alignment alternatives from SR-14 to the Los Angeles/San Bernardino County line then east to Apple Valley area is depicted on the Site Location Map (Figure 1). Planned additional improvements associated with this project include SR-14 widening extending from approximately Avenue S (south) to Avenue N and the addition of four connectors (Connectors A, B, C, and D) from SR-14 extending east to the HDC alignments. A limited subsurface investigation was conducted along the corridor alignment at some of the proposed structure locations to aid in preparation of the respective Structure Preliminary Geotechnical Report (SPGR) for each bridge and this DPGR. The Office of Geotechnical Design South 2 (OGDS2) is preparing a separate DPGR report for the San Bernardino County Segment of the alignment.

Figure 1 – HDC D7 and D8 Preliminary Proposed Alignment Alternatives Map

SCOPE OF WORK

Tasks completed by OGDS1 for the Los Angeles County portion of the HDC include the following:

1. Review of pertinent information from As-Built Log of Test Borings (LOTB's) for the existing bridges along SR-14 (Antelope Valley Freeway) and existing Rte 138 (trending west to east, located south of proposed HDC alignments, and shown in yellow on Figure 1);
2. Review of the regional geology, groundwater well information, and preliminary potential flood zones;
3. Preliminary evaluation of the seismicity and associated secondary hazards;
4. Limited preliminary geotechnical exploration (drilling/sampling/laboratory testing of eight geotechnical borings located at select locations along the Los Angeles County portion of the alignment); and

5. Preliminary geotechnical engineering evaluation and preparation of this report to assist with engineering design and cost estimates for the project.

EXISTING FACILITIES

Existing facilities in the northwestern portion of the proposed HDC alignments (mostly adjacent to Technology Drive/Avenue P-8 in Palmdale) include SR-14 (state facilities), Sierra Highway and the adjacent Metrolink/Union Pacific Railroad tracks, Palmdale School District administrative buildings and private businesses at 10th Street East, private buildings/residences near 15th Street East, Los Angeles World Airports (LAWA) property drainage facilities (flood basin) and private residences near 20th Street East, then crossing over mostly rural areas from 30th through 50th Streets East (south of existing and proposed Palmdale Airport) before alignment alternatives 2 and 3 split between Avenue P-8 (on the north) and Avenue Q (on the south) and cross over unpaved/undeveloped property owned by either LAWA (north) or located within the City of Palmdale (south) to cross paved 70th Street East before the alignment alternatives join together and cross undeveloped Little Rock Wash (on LAWA property) and paved 90th Street East (adjacent to Avenue P-8 projection). The HDC alignments continue east over unpaved rural roads including 100th Street East before turning southeast and crossing 110th Street East and Avenue Q then paved Palmdale Blvd in the vicinity of 120th Street East projection. Then the HDC alignment alternatives in the rural southeastern portion of the proposed project proceed east in the area between adjacent Palmdale Blvd and Ave R crossing Longview Road (135th Street East), and 140th Street East, and Big Rock Wash (with several private residences) before splitting near 150th Street East with alignment alternative 2 located between Palmdale Blvd and Avenue R trending all the way east past 240th Street East to the Los Angeles/San Bernardino County Line and alignment alternative 3 located adjacent and south of Avenue R until about 220th Street East then confined between Palmdale Blvd (including projected Palmdale Blvd) and Avenue R to the Los Angeles/San Bernardino County Line.

PROPOSED IMPROVEMENTS

The High Desert Corridor is proposed to provide an east-west freeway route across the western Mojave Desert, linking the high desert communities of Palmdale, Lancaster, Adelanto, Victorville, and Apple Valley. The proposed HDC includes three alternatives; Alternative 1 (no build), and alignment alternatives 2 (north alignment) and 3 (diverges south of alignment alternative 2 at various locations as mentioned above).

The HDC Los Angeles County Segment is proposed as a 6 to 8 lane freeway with travel directions separated by a center median of varied width. The alignments include approximately 4 connectors (Connectors A, B, C, and D) from SR- 14 to the proposed HDC, 2 viaducts (SR 14 to 10th Street East Left and Right Viaducts) and 18 bridge structures at interchanges (L/R bridges

are considered herein as one structure). Each of the overcrossing and/or undercrossing bridges and connecting structures are proposed to be supported on cast-in-drilled-hole (CIDH) piles although pile diameter may vary according to design requirements and variable foundation conditions. Other pile foundation alternatives may also be considered in the future based on design requirements and foundation constructibility. Mescal Creek (near 215th Street East) will be treated separately by D07 Design or Maintenance.

Some widening (11 existing bridges) and ramp improvements are also proposed along existing SR-14 from approximately Avenue S (in the south) extending to Avenue N (in the north) and Connectors B and C will cross over SR-14 in the area of Technology Drive (Avenue P-8). The widenings allow increased traffic flow near SR-14 Connectors to the proposed HDC.

A Structure Preliminary Geotechnical Report (SPGR) has been prepared separately for the respective planning of each structure. A limited select subsurface investigation with minor laboratory testing has been conducted to provide preliminary subsurface information for use in the design studies for each of the proposed structures.

Alignment Alternative 2 (provided by District 7, March 29, 2012) proposes minor cuts ranging from 2 to 15 feet deep and fill embankments ranging from 4 to 21 feet height above existing natural grade for the majority of the proposed HDC roadway along the alignment. Alignment Alternative 3 proposes no cuts along the alignment length with fill embankments ranging from 15 to 18 feet height. Approach embankment fills up to approximately 30 feet high may be proposed for the SR-14 Connectors.

PHYSICAL SETTING

Topography and Drainage

The HDC Los Angeles County segment is located in the High Desert area of southern California to the north of the San Gabriel Mountains, consisting of broad alluvial filled valleys, dry washes, and playas separated by localized mountains. Topographically, elevations along SR-14 range from 2940 to 2600 feet (high in hills just north of Avenue S and low near Avenue N to the north and furthest distance away from the mountains, respectively). Following the proposed west-east trending HDC alignments, elevations range from approximately 2630 feet (north of Technology Drive and east of adjacent SR-14) and slope down to about 2590 feet at 50th Street East and 2591 feet on the west bank of Little Rock Wash. Elevations climb for the southeastern portion of the alignments to 2777 feet at Big Rock Wash, 2813 feet at 170th Street East, 2883 feet at 210th Street East, 2951 feet at 240th Street East, and 3000 feet at the Los Angeles/San Bernardino County Line.

The topography of the site generally consists of gently northward sloping coalesced distal alluvial fans with drainage generally to the north. Some local hills follow the San Andreas Rift Zone in the area just north of Avenue S on SR-14 (at the southwest end of the project). Sporadic

local granitic hills and buttes are present north and south of the proposed alignments from approximately 140th Street East to 240th Street East.

The Los Angeles County portion of the proposed HDC alignments and existing SR-14 are located within the Antelope Valley Watershed (Parsons, November, 2011a, High Desert Corridor Preliminary Hydrology and Hydraulics Report - Draft). Drainage is mostly by sheet flow and also flow into local washes/creeks or sporadic existing man-made channels. Existing streams or washes are incised channels into Recent and older alluvial fan complexes (older alluvial fan deposits are located mostly to the south of the project on the north side of the San Gabriel Mountains and at depth). Watersheds eventually drain north into Rosamond, Rogers, and Lake Los Angeles (all dry lakes north of the HDC alignments). Drainages in this area are normally dry except during high local rainfall or heavy rain or snow in the San Gabriel Mountains located south of the alignments.

In the western area of the project across SR-14, Amaragosa and Anaverde Creeks drain to the northeast and are channelized or spanned by bridges for the existing elevated freeway. Heading in a west to east direction, a portion of the proposed HDC alignments are located in Flood Zone AO (Parsons, 2011a) which extends (about 0.5 mile) on the east side of SR-14 roughly from Division Street east to near Sierra Highway. Two viaducts are proposed to span over this area that can have potential flooding (viaducts would extend from just east of SR-14 to approximately 10th Street East. Numerous unnamed drainages are present from 10th to 50th Street East. Little Rock Wash is a major sandy wash drainage (within Flood Zone A, Parsons, 2011a) which crosses the alignments extending from about 1600 feet east of 70th Street East to about 2500 feet west of 90th Street East and drains north to northwest. The wash with small tributaries is about 1 mile wide across the alignment and bridges are proposed to span the wash. The next major northwest trending drainage is Big Rock Wash (also within Flood Zone A, Parsons, 2011a) which would cross the alignments between 140th and 150th Streets East. Some small drainage channels are also present to the west of Big Rock Wash crossing the alignment from about just east of 120th Street East to about 140th Street East. These small drainage channels are part of the Big Rock Wash alluvial fan. Bridges are proposed to span the Big Rock Wash sandy channel. Additional small northwestward trending drainage channels cross the proposed alignments from about 183rd to about 213th Streets East and include unnamed drainages, Graham Canyon Creek and Mescal Creek. A drainage structure is proposed at Mescal Creek.

The proposed alignments pass through the northern portion of Palmdale (where future drainage improvements are planned but currently don't exist) and into more rural areas to the east and southeast. To prevent uncontrolled flooding, most (alignment alternative 2) or all (alignment alternative 3) of the proposed corridor roadway will be raised above original ground elevation.

SUBSURFACE INVESTIGATION

Subsurface information was obtained by OGDS1 drilling/sampling seven - 6 inch diameter hollow stem auger (HSA) borings and one - 4.5 inch rotary sample boring from December 2011 through April 2012. Groundwater was monitored from February 22 through April 11, 2012 within piezometer Boring R-12-009 (depth 140.9 ft) which was dry to bottom of the hole. Groundwater was also checked within all hollow stem auger borings. Boring Information obtained from the field studies will be shown on the Log of Test Borings (LOTB's) for select proposed new HDC bridges. A summary of exploratory borings for the proposed HDC alignments is shown in Table 1 below.

Table 1- Summary of Recent Boring Information

Boring No./ Approximate Location	Offset & Stationing Centerline Prop. HDC*	Coordinates (US State Plane 1983/US survey foot)	Date/s Drilled	Top of Hole Elevation ft	Total Depth ft	Measured Groundwater Elevation (ft)
R-12-009 (piezometer)/ 192' N. of Technology Dr., 908' E. of SR-14	N/A	N 2038973.625 E 6522137.852	02-21/22-12	+2629.9	140.9	No Groundwater Encountered (meas. from 2/23/2012 to 4/11/2012)
A-12-001/ 5' S. of Ave. P-8, 85' E. of 10th St. East	N/A	N 2038757.156 E 6528048.613	02-15-12	+2611.7	100.5	No Groundwater Encountered (meas. 2/15/2012)
A-12-002/ 670' S. of Ave. P-8, 52' E. of 20th St. East	N/A	N 2038171.974 E 6533352.563	04-11-12	+2593.4	101.5	No Groundwater Encountered (meas. 4/11/2012)
A-11-003/ 1095' S. of Ave. P-8, 2' W. of E. EP 50th St. East	N/A	N 2037686.843 E 6549400.736	12-6/7-11	+2590.5	101.5	No Groundwater Encountered (meas. 12/7/2011)
A-12-004/ on center dirt road about 130' N. of Ave. P-8 projection, about 1600' E. of 70th Street	N/A	N 2038833.785 E 6561743.958	04-10-12	+2591.2	100.5	No Groundwater Encountered (meas. 4/10/2012)

East, 45' W. of Little Rock Wash Channel						
A-11-006/ 330' S. of Ave. R, 3' W. of E. EP 170th St. East	N/A	N 2030461.887 E 6613895.488	12-8/13-11	+2812.8	96.4	Perched Water Layer +2737.0 to +2736.7/ Static Groundwater Surface +2732.8 (meas. 12/13/2011)
A-12-007/372' S. of Ave. R, 6' W. of 210th St. East	N/A	N 2030463.311 E 6635157.111	02-14-12	+2883.1	100.5	No Groundwater Encountered (meas. 2/14/2012)
A-11-008/ 1712' S. of Palmdale Blvd., 1' E. of W. EP 240th St. East	N/A	N 2031736.391 E 6651178.254	12-14/15-11	+2951.1	101.5	No Groundwater Encountered (meas. 12/15/2011)

Note: *Offset and Stationing Not Available as alignment not finalized at this time.

Standard Penetration Tests (SPT) were performed at all the borings. Blow counts (SPT N values) were recorded at 5 ft intervals. SPT's were performed in accordance with ASTM Test Method D1586-84 using the standard 1.4 inch I.D. split spoon sampler with a 140 lb hammer dropped 30 inches. Caltrans engineers/geologists logged the sample borings.

D07 Surveys provided coordinates for boring locations and top of boring elevations (based on NAD83 horizontal datum and NAVD88 vertical datum).

LABORATORY TESTING

Laboratory testing of soil samples (at Caltrans HQ Laboratory) consisted predominantly of corrosion testing of composite and individual soil samples, particle size analysis/hydrometer, and minor determination of Atterberg Limits. Laboratory Testing is summarized below in Table 2.

Table 2 - Laboratory Test Methods

Test	Standard	No. of Tests Performed
Particle Size Analysis	ASTM D 422 (#200 by ASTM D 1140)	19
Mechanical Analysis (Hydrometer)	CTM 203/ASTM D 4318	19

Atterberg Limits (Plasticity Index, Liquid Limit)	AASHTO T 90, AASHTO T 89	19
Moisture Content	ASTM D 2216	19
Corrosion – Chloride Content	CTM 422	1
Corrosion – Sulfate Content	CTM 417	1
Corrosion – Minimum Resistivity	CTM 643	32
Corrosion – pH	CTM 643	32

CORROSION EVALUATION

Corrosion test results for representative soil samples are presented in Table 3 below. The results show there is one surface soil sample along SR-14 [just south and adjacent to Rancho Vista Blvd UC, previously taken for an MSE Wall investigation noted in SPGR for Rancho Vista Blvd UC (Wdn), M. Merriam, February 27, 2012] that is considered corrosive. The remaining 30 composite and 2 individual soil samples, taken within the recent 2011/2012 Caltrans preliminary geotechnical investigation for the proposed HDC alignments (consisting of 8 exploratory borings), are considered non-corrosive to reinforced concrete and metal. Additional corrosion sampling and testing is warranted for both the SR-14 widening segment and for the proposed HDC alignment once plans are finalized. Refer to Table 1 for specific boring locations.

Table 3 - Corrosion Test Summary

Structure Name/ Boring No.	Depth (ft)	Minimum Resistivity (ohm – cm)	pH	Chloride Content (PPM)	Sulfate Content (PPM)
MSE Wall, SR-14 @ PM 61.37 (just S. of Rancho Vista Blvd UC)	Surface	530	8.24	821	833
Connectors A-D (New), R-12-009	5.1-30.8	1440	8.18	N/A	N/A
	40.1-61.6	7360	6.56	N/A	N/A
	65.1-101.0	7130	6.98	N/A	N/A
	105.1-140.9	8108	7.14	N/A	N/A
SR-14 to 10th ST E Viaducts (New), A-12-001	9.0-45.5	4600	7.30	N/A	N/A
	49.0-75.5	5170	8.13	N/A	N/A
	79.0-100.5	5750	8.27	N/A	N/A
20th ST OC and UC (New), A-12-002	5.0-31.5	3600	7.92	N/A	N/A
	40.0-71.5	6360	7.99	N/A	N/A
	75.0-101.5	6000	8.19	N/A	N/A
50th ST E OC, UC, & UC Alt B (New), A-11-003	1.0-5.0	11175	8.48	N/A	N/A
	25.0-46.5	8626	8.91	N/A	N/A
	60.0-91.5	5967	8.26	N/A	N/A
	100.0-101.5	3565	8.10	N/A	N/A
Little Rock Wash	4.0-35.5	5880	7.37	N/A	N/A

Br. (New), A-12-004	39.0-60.5	20400	7.79	N/A	N/A
	64.0-90.5	18000	7.89	N/A	N/A
	94.0-100.5	20400	8.06	N/A	N/A
170th ST E OC (New), A-11-006	2.0-11.5	1235	7.97	N/A	N/A
	15.0-16.5	943	8.21	24	825
	30.0-61.5	2123	8.37	N/A	N/A
	65.0-81.5	1469	8.20	N/A	N/A
	90.0-96.4	1925	8.35	N/A	N/A
210th ST E OC (New), A-12-007	0-20.5	1725	8.02	N/A	N/A
	24.0-50.5	3995	8.53	N/A	N/A
	54.0-80.5	1528	8.77	N/A	N/A
	84.0-100.5	1410	8.73	N/A	N/A
240th ST E OC (New), A-11-008	5.0-21.5	1603	8.90	N/A	N/A
	25.0-41.5	2748	9.06	N/A	N/A
	45.0-61.5	4570	8.87	N/A	N/A
	65.9-81.5	3350	8.97	N/A	N/A
	85.0-101.5	1401	8.48	N/A	N/A
Corrosive Guidelines		<1000	**≤5.5**	**≥2000**	**≥500**

Note: It is the practice of Caltrans Corrosion Technology Section (with the exception of MSE Walls) if the minimum resistivity of the sample is greater than 1000 ohm-cm and the pH is greater than 5.5, the sample is considered to be noncorrosive. For structural elements, the Caltrans considers a site to be corrosive if one or more of the following conditions exist for representative soil and/or water samples taken at the site: Chloride concentration ≥500 ppm, sulfate concentration ≥2000 ppm, or the pH is ≤5.5. Corrosion mitigation is required if one or more of the 3 conditions noted above exists where structural elements are involved (Caltrans Corrosion Guidelines, September 2003).

GEOLOGY AND SUBSURFACE CONDITIONS

Regional Geology

The HDC alignments are located in the Mojave Desert Geomorphic Province of southeastern California and the Los Angeles County segments are located within the Antelope Valley (high desert). The Mojave Desert is bounded on the southwest by the San Andreas Fault Zone and Transverse Ranges (including the San Gabriel Mountains at the site), on the north and northwest by the Garlock Fault and Tehachapi and Sierra Nevada Mountains, and to the northeast by the Basin and Ranges and by the Sonora Desert region to the east. The Mojave Desert is generally characterized as an elevated alluviated area with internal drainages separated by mountainous bedrock blocks which are predominantly controlled by the seismically active northwest – southeast trending strike-slip fault pattern of the region. The proposed HDC alignment area contains broad northward sloping coalesced alluvial fans, valley plains, and lacustrine basins (located north of the alignments) separated by local Mesozoic predominantly granitic (quartz monzonite and some diorite) and minor mafic (basic) intrusive hills and buttes north and south of

the alignments. The alluvial fans in the Antelope Valley HDC alignment area were derived from the San Gabriel Mountains to the south.

At the southern boundary the core rocks for the adjacent San Gabriel Mountains and Sierra Pelona area have a complex combination of Precambrian granitic/syenite/gabbro/anorthosite and metamorphic rocks, rare Paleozoic limestone outcrops surrounded by Mesozoic granite/gneiss, Pre-Cretaceous metamorphic rocks (Pelona Schist), and additional Mesozoic granite, quartz monzonite, diorite, and mafic intrusive rocks. Cenozoic rocks and sediments either overlie or are in unconformable or fault-bounded contact with the older core rocks in the San Gabriel Mountains. Cenozoic rocks and sediments in the San Gabriel Mountains include rare Paleocene marine rocks (San Francisquito Formation, central and easternmost portion near the Los Angeles County Line), Oligocene volcanic and nonmarine sedimentary rocks (Vasquez Formation), undivided Miocene nonmarine rocks (Punchbowl Formation), Pliocene Anaverde Formation and other undivided Pliocene nonmarine formations (Crowder Formation, pebbly sandstone), overlain by Pleistocene nonmarine older alluvium and Nadeau Gravel and undifferentiated older Pleistocene and Recent alluvium. Recent Alluvium is also confined to the stream valleys in the mountainous area. Along the San Andreas Rift Zone (north side of the mountains) faulted and fragmented units include Precambrian igneous and metamorphic rocks, Pre-Cretaceous Pelona Schist, Mesozoic granite, diorite, and small outcrops of mafic intrusive rocks, Paleocene marine and Oligocene nonmarine sedimentary rocks, Miocene nonmarine Punchbowl Formation rocks, and undivided Pliocene nonmarine plus Pliocene Anaverde Formation (composed of shale, sandstone, conglomerate, and diorite breccia sedimentary units). Quaternary deposits within the Rift Zone and also extending away from the Mountains and out into the Antelope Valley include Pleistocene Nadeau Gravels and older alluvium, some Quaternary terrace deposits, and Recent alluvium.

Site Geology and Subsurface Conditions

As-Built Log of Test Boring (LOTB) elevations for SR-14 bridges are likely based on NGVD29 datum (mean sea level) and are not adjusted to the current NAVD88 datum. At the present time, a probable elevation adjustment (add) of about +2.7 ft to As-Built boring elevations is generally estimated to adjust to the current NAVD88 datum. The correct elevation adjustments for As-Built boring elevations will have to be verified by D07 Surveys in the future. Elevations given below for existing SR-14 bridges are based on unadjusted As-Built elevations. Based on review of the As-Built LOTB's for SR-14 bridges, generalized soil profiles are provided in a south to north direction.

1) At the southern end of SR-14, Avenue S Undercrossing (UC), Br. No. 53-1417, has approximately 15 to 21 ft of embankment fill (embankment ranges between elevations 2869 to 2873 ft down to elevations 2848 to 2855 ft). Fill is composed of dense, silty sand. Holocene or older undifferentiated Quaternary alluvium ranges between elevations 2848 to 2855 ft down to 2835 ft and possibly as low as 2820 ft (about 17 to a maximum of 30 ft thick). Holocene and older Quaternary alluvium is composed of loose to medium dense (some dense to very dense)/very soft, interbedded silty sand, sand, sandy silt, clayey silt, with sporadic gravel and caliche veins. Underlying soft formational sedimentary material

(possible Pliocene Anaverde Formation claystone and sandstone, below approximate elevations 2835 to 2820 ft down to 2792 ft) consist of interbedded siltstone, sandstone, and sandy claystone with sporadic gravel (described as dense to very dense/very stiff to hard, silty sand, sand, silt, sandy clay, and clayey silt with sporadic gravel. Siltstone interbeds are also mentioned).

2) At Anaverde Creek Bridge, Br. No. 53-1440, embankment fill ranges from about 25 to 7 ft thick (embankment ranges between elevations 2768 to 2761 ft down to 2754 to 2741 ft). Fill is composed of mostly silty sand and sandy silt. Holocene or older undifferentiated Quaternary alluvium ranges between elevations 2754 to 2741 down to elevations 2747 to 2706 ft. The alluvium is composed of loose to very dense, silty sand, sand, and sandy silt with sporadic gravel and gravel interbeds. Some of the gravel may be part of the Pleistocene Nadeau Gravel. Underlying soft formational sedimentary material consists of sandstone (probably Pliocene Anaverde Formation down to elevation 2697 ft).
3) At Palmdale Blvd UC, Br. No. 53-1419, embankment fill ranges from about 13 to 20 ft thick (embankment ranges between elevations 2703 to 2700 ft down to 2690 to 2680 ft). Holocene or older undifferentiated Quaternary alluvium ranges between elevations 2690 to 2680 ft down to 2665.4 ft (21.5 ft depth was the maximum boring depth). The alluvium can be divided into 2 units. The upper alluvial unit ranges from elevations 2690 to 2680 ft down to approximately 2674 ft (thickness ranges from approximately 16 to 6 ft) and is composed of dense, sand, gravel, and sandy silt interbeds. The lower alluvial unit ranges from about elevations 2674 ft down to 2665.4 ft (8.6 ft was encountered within rotary Boring B-1) and is composed of dense to very dense, interbedded sand, gravel, and silty sand. This lower alluvial unit may be part of the Pleistocene Nadeau Gravel.

On the remaining SR-14 segment where existing bridges will be widened or new SR-14/HDC connectors added, most of the bridges (from Avenue Q in the south to Avenue N in the north) are founded within Recent and undifferentiated older Quaternary alluvium as determined from geologic maps and As-Built LOTB's. Embankment fills range from elevations 2655 to 2689 ft (at Technology Drive UC and Rancho Vista Blvd UC, respectively) down to elevations ranging from 2674 to 2586 ft (at Rancho Vista Blvd UC and north at Avenue N OC, respectively). SR-14 fills for this area (from Avenue Q to Avenue N) range in approximate thickness from 6 to 29 ft thick (partially thin at Technology Drive and thickest at South Amargosa Creek Bridge). Avenues O and N Overcrossings, in the north, are built over SR-14 Freeway 2H:1V cut sections about 26 ft deep. In the area from Avenue Q UC through South Amargosa Creek Bridge, underlying Recent and undifferentiated older Quaternary alluvium is undivided and ranges in elevations from 2674 to 2636 ft (at Rancho Vista Blvd UC and Technology Drive UC, respectively) down to elevations 2623 to 2587.5 ft (Rancho Vista Blvd UC and Technology Drive UC, respectively). The upper 30 to 51.5 ft of alluvium was explored in this area and is composed of medium dense to very dense, silty sand with sporadic gravel interbedded with sand with gravel, sand, and gravelly sand. In the remaining northern portion of SR-14 from 10th Street West UC through Avenue N OC, Recent and undifferentiated older Quaternary alluvium can be divided into two units. The upper alluvial unit ranges from elevations 2663 to 2586 ft (at 10th Street West UC and Avenue N OC) down to elevations 2647 to 2574 ft (at Avenue O-8 UC to Avenue N OC). The 12 to 20 ft thick upper alluvial unit in this area is composed of generally medium dense to dense (rare loose), sand with sporadic gravel, silty sand, and sand with silt and

sporadic gravel. The lower alluvial unit ranges from elevations 2647 to 2574 ft down to elevations 2613 to 2534 ft (deepest penetration and exploratory borings very from 53.6 to 52.1 ft depth at 10th Street West UC and Avenue N OC). The 31 to 42 ft thick explored portion of the lower alluvial unit is composed of generally dense to very dense (rare medium dense), sand with sporadic gravel interbedded with silty sand, gravel, and sand with silt and sporadic gravel. Review As-Built LOTB's and Structures Preliminary Geotechnical Reports (SPGR's) for more specific information.

All surveyed elevations used for the 8 HDC alignment geotechnical borings are based on NAVD88 datum [which is estimated at 2.7 ft higher than comparable Mean Sea Level (MSL) elevations (based on NGVD29 datum)]. This current elevation adjustment from MSL elevations will need to be verified by D07 Surveys or private survey party. The proposed mostly west to east trending HDC alignments for the Los Angeles County segment will mostly overlie Recent and undifferentiated older Quaternary alluvial units. A few minor exceptions include Quaternary lake deposits (between approximately projected 185th to 190th Streets East) and Recent dune sand (between approximately projected 233rd to 236th Streets East). Mesozoic granitic outcrops are also very close to the proposed alignments between projected 217th to 224th Streets East and may exist at fairly shallow depths beneath alluvium in this area. Asphalt concrete pavement (1 ft thick) was present within borings located at 50th Street East (OC, UC, & UC Alt – New) and 170th Street East OC (New). Sporadic thin undifferentiated fill/alluvium was present within borings at 10th Street East/Avenue P-8 [2 ft thick, SR-14 to 10th Street East Viaduct (L & R, New)] and 50th Street East/south of Avenue P-8 [2 ft thick, 50th Street East OC, UC, & UC Alternative – New). The undifferentiated fill/alluvium is composed of sandy silt (10th Street East) and sandy silt with gravel (50th Street East). Levee fill was present at the drill site on LAWA flood control basin property on the eastside of 20th Street East/south of Avenue P-8 [5 ft thick, 20th Street East OC & UC – New]. Levee fill for the LAWA flood basin is composed of sandy silt with trace gravel. In the area from SR-14/Technology Drive UC (Connectors A,B,C, and D – New) through 10th Street East (SR-14 to 10th Street East Viaducts-New), 20th Street East (20th Street East OC and UC-New), 50th Street East (50th Street East OC, UC, UC Alt.-New), and Little Rock Wash Bridge-New (northern boring sites from west to east mostly located near Technology Drive/Avenue P-8), underlying Recent and undifferentiated older Quaternary alluvium ranges in elevations from estimated 2649 to 2587 ft down to estimated elevations 2590 to 2489 ft. At SR-14/Technology Drive UC (Avenue P-8) alluvium consists of one unit composed of very dense, sand with sporadic gravel and silty sand (down to 50 ft depth). Fill ranges from 6 to 19 ft thick at this SR-14 site. From Technology Drive and SR-14/HDC Connectors A-D area (approximately 900 ft east of SR-14) through Little Rock Wash, Recent and undifferentiated older Quaternary alluvium can be divided into two units. The upper alluvial unit ranges from elevations 2630 (Technology Drive and Connectors A-D) to 2587.5 ft (50th Street East OC and UC) down to elevations ranging from 2607 (Technology Drive and Connectors A-D) to 2540.2 ft (50th Street East OC and UC). The 23 to 56 to 14.5 ft upper alluvial unit (Connectors A-D, SR-14 to 10th Street East Viaducts, and Little Rock Wash Bridge sites, respectively) is composed of medium dense to dense (rare very dense)/stiff to hard, sandy silt, interbedded with silty sand with sporadic gravel, sand with silt and gravel, gravel with sand, clayey sand, sandy lean clay, and lean clay with sand. Unconfined compression values (measured with pocket penetrometer) for cohesive deposits range from >4.5 to 1.5 TSF. The

underlying lower alluvial unit ranges from elevations 2607 (Technology Drive and Connectors A-D) to 2540.2 ft (50th Street East OC and UC) down to sampled elevations 2489.0 to 2511.2 ft (Technology Drive and Connectors A-D and 50th Street East OC and UC to SR-14 to 10th Street East Viaducts, respectively). The sampled portion of the lower alluvial unit ranges from 118 to 42.5 ft thick and is composed of very dense to dense (minor medium dense)/hard to very stiff, silty sand with sporadic gravel interbedded with sandy silt, sand with silt, clayey sand, gravel with sand, sandy lean clay, and minor sandy silty clay. Unconfined compression values (measured with pocket penetrometer) for cohesive deposits range from >4.5 to 2.0 TSF. Little Rock Wash Bridge lacks cohesive deposits in the lower alluvial unit and contains more gravel with sand lenses. In the southeastern portion of the Los Angeles County HDC alignment alternatives (located on alluvial fans closer to the San Gabriel Mountains), two sample borings were completed at 170th Street East OC (New) and 210th Street East OC (New)/just south of Avenue R. In this area, Recent and undifferentiated older Quaternary alluvium can be divided into two units. The upper alluvial unit ranges from elevations 2811.8 to 2883.1 ft down to elevations 2787.3 to 2855.1 ft [170th Street East OC (New) and 210th Street East OC (New), respectively]. The 24.5 to 28 ft thick upper alluvial unit is composed of medium dense (rare loose)/medium stiff to very stiff, silty sand interbedded with sandy silt, silt, sandy lean clay, sand, and sand with silt. In the upper alluvial unit, the sand and sand with silt interbeds are confined to the 210th Street East OC (New) site. Unconfined compression values (pocket penetrometer) range from 0.75 to 2.0 TSF. The lower alluvial unit ranges from elevations 2787.3 to 2855.1 ft down to sampled depths ranging from 2716.4 (170th Street East OC – New) to 2782.6 ft (210th Street East OC – New). The sampled portion of the lower alluvial unit ranges from 70.9 to 72.5 ft thick (170th Street East OC – New to 210th Street East OC – New) and is composed of very dense to dense/hard to medium stiff, silty sand with sporadic gravel interbedded with sand with silt, gravel with sand, gravel with sand and silt, sandy silt, sandy lean clay, and lean clay with sand. Gravel lenses are more abundant at 170th Street East OC (New) and gravel fraction is coarser (≤3inches). Unconfined compression (pocket penetrometer) values for the lower alluvial unit range from >4.5 to 0.9 TSF. Approximately east of 224th Street East (this is considered as a general boundary between two localized basins along the HDC alignment in Los Angeles County) is the southeasternmost basin which extends out east past the Los Angeles County/San Bernardino County Line. A boring was drilled/sampled at 240th Street East OC (New)/south of Palmdale Blvd and overall soil characteristics are less consolidated with lower apparent densities/consistencies and also generally finer-grained than comparative borings west of this area. At the 240th Street East boring site, asphalt concrete pavement (10" thick) is underlain by 8" of roadway base material (gravel with sand). Underlying Recent and undifferentiated older Quaternary alluvium can be divided into two units. The upper alluvial unit ranges from elevations 2949.6 down to 2918.1 ft. The 31.5 ft thick upper alluvial unit is composed of medium dense to loose/medium stiff to stiff, silty sand interbedded with sand, sand with silt, sandy silt, and minor clayey sand, lean clay with sand, and sandy lean clay. Unconfined compression values (pocket penetrometer) range from 0.5 to 1.75 TSF. The lower alluvial unit ranges from elevations 2918.1 ft down to sampled lower elevation 2849.6 ft. The sampled portion of the lower alluvial unit is 68.5 ft thick and is composed of very stiff to medium stiff/medium dense to dense (rare very dense), sandy lean clay interbedded with sandy silt, silty sand with gravel, and minor lean clay with sand and sand. Gravel is generally ≤1.5 inches.

Some paleosol hardpan and few calcite nodules (≤1.0 inch) were present. Unconfined compression (pocket penetrometer) values for the lower alluvial unit range from 0.5 to 3.0 TSF.

Groundwater

Regional groundwater measurements generally indicate the depth to water is deep below the ground surface in the region. However, depth to groundwater can be quite variable throughout the 29 mile long HDC proposed segment alignments and SR-14 proposed widenings. Local creeks and washes provide some water recharge during local storm events or rainfall and snowmelt from the San Gabriel Mountains, especially for the alignment segments close to the San Gabriel Mountains.

Groundwater was not encountered within seven of the total eight HDC alignment exploratory borings that were excavated during the recent 2011/2012 Caltrans investigation (refer to Table 1 – Summary of Recent Boring Information with boring depths, groundwater elevations if encountered, and dates measured). Perched water was encountered between 75.8 to 76.1 feet depth and static groundwater was encountered at 80.0 feet depth below grade in auger Boring A-11-006 drilled for the 170th Street East OC (New) (measured on 12/13/2011, perched water layer between elevations +2737.0 to +2736.7, static groundwater surface at +2732.8 ft elevation). At the 170th Street East OC (New) site, local irrigation is established for farming and the site is approximately 1.7 miles northeast of Big Rock Wash and likely receives some recharge contribution from the Big Rock Wash alluvial fan drainage exiting the San Gabriel Mountains. Seven of the borings were hollow stem auger borings (boring identification begins with A) and the single rotary boring (boring identification begins with R) was a piezometer boring with multiple groundwater measurements taken over about a 6.5 week period. All borings were dry to bottom except Boring A-11-006 at 170th Street East.

Groundwater information obtained from As-Built LOTB's, earlier Foundation Investigations, California Geological Survey (CGS) Seismic Hazard Maps (with shallowest depth to groundwater contours), and personal communications for existing SR-14 bridges are provided by Merriam [Structures Preliminary Geotechnical Reports (SPGR's), completed from February to May, 2012, shown in references]. The SPGR's show groundwater could be rather shallow at Avenue "S" UC, Anaverde Creek Bridge, possibly perched water at Palmdale Blvd. UC, and possibly shallow at S. Amargosa Creek Bridge. Intermittent surface flow at the creeks during storms/floods could raise the groundwater temporarily. For the remaining bridges at SR-14, groundwater level is considered deep (>50 ft and usually much deeper).

For the proposed HDC alignment bridges and proposed new SR-14/HDC Connectors A-D (A and B are south, C and D are north) groundwater is usually deep and is discussed in detail within SPGR's provided by Piratheepan (SPGR's completed in March 2012) and Halda (SPGR's completed in June 2012). Limited groundwater information was obtained from the 2011/2012 Caltrans field investigation. Historic groundwater records were also obtained from monitoring well records of Los Angeles County Department of Public Works (LACDPW) and California Department of Water Resources (DWR) Water Data Library. Please review the individual

SPGR's (listed in the references) for specific groundwater data including historic high groundwater information for each bridge.

For the proposed HDC alignment bridges groundwater is generally deep especially in the northern segment of the alignment, however, shallow water may be found near flood basins, Little Rock Wash alluvial fan and channel, and Big Rock Wash alluvial fan (including 170th Street where perched water and static groundwater was discovered below 75.8 and 80 ft depth, respectively). The Big Rock Wash alluvial fan also extends out west to at least 140th Street and possibly 120th Street along the alignment. Mescal Creek and numerous smaller channels/washes are also present along the HDC alignments. Flood events and high snowfall can raise the groundwater significantly near the creeks and washes. It is also possible that isolated or perched groundwater zones will be encountered due to local irrigation, groundwater recharge, construction activities, locally intense rainfall, or runoff from prolonged winter seasons with heavy rain and/or snowfall, or numerous other man-made or natural sources. Shallow groundwater might be anticipated due to seasonal variations in rainfall, runoff, surface flow and recharge at washes or drainages, and dry lake beds along the alignment segments. Further investigation regarding groundwater is recommended.

Surface Water

Surface water information for the SR-14 widenings and proposed HDC alignment bridges is provided in the aforementioned SPGR's. Parsons (November 2011a and b) has provided a High Desert Corridor Preliminary Hydrology and Hydraulics Report (Draft) and High Desert Corridor Preliminary Geomorphology Report (Draft). The Los Angeles County portion of the HDC and SR-14 are in the Antelope Valley Watershed. Zone AO extends from Division Street to Sierra Highway and is in a 100 year flood zone where flood inundation depths could range from 1 to 3 feet. Flood Zone A (an area inundated by 100 year flooding but which no Base Flood Elevations are established) surrounds and includes Little Rock Wash and also surrounds and includes Big Rock Wash (from 120th Street East to 150th Street East) along the proposed HDC alignments. For a 100 year flood event (Parsons, 2011a & b) surface flows at Little Rock Wash are estimated at 22,944 cfs and Big Rock Wash estimated at 17,268 cfs. The study mentions for the 100 year flood event flow depths and velocities range from 2 to 4 feet depth and V100 ranges from 2 to 4 fps (exhibiting little to no scour potential) within Little Rock Wash. For the 100 year flood event for Big Rock Wash, the study mentions flood event flow depths and velocities range from approximately 2 feet depth and V100 ranges from 4 to 5 fps. Even though scour might be considered minimal for these washes, OGDS1 recommends additional field investigation including exploratory borings in the washes to evaluate potential effects of local scour assuming the bridges with supporting piers will be built. Also, the same field investigation in the washes would confirm susceptibility to liquefaction. Additional field investigation is also recommended at SR-14 Anaverde Creek Bridge and S. Amargosa Creek Bridge as mentioned in the SPGR's. Additional Hydrology and Hydraulics information will be required before or during PS & E stage. Additional information is also required from Hydrology and Hydraulics regarding drainage and recharge basins locations/information which could affect foundation capacities and cause settlement issues.

SEISMICITY AND GEOLOGIC HAZARDS

Preliminary seismic hazard evaluations (seismicity, ground shaking, fault rupture, and liquefaction) and recommendations for the SR-14 structure widenings and proposed HDC structures in Los Angeles County were addressed in a separate report titled "Initial Preliminary Seismic Design Recommendations", dated November 18, 2011, by Mr. Thang Le and Dr. Mohammed Islam. The Initial Preliminary Seismic Design Recommendations for the Los Angeles County segment are presented in Appendix A for your reference. A specific Fault Rupture Report for Avenue S Undercrossing (Wdn), Br. No. 53-1417, dated June 15, 2012, completed by Ms. Martha Merriam and Mr. Douglas Cook has also been provided.

The principal geologic hazard is considered to be strong ground shaking associated with regional seismic events. Multiple active faults are present in the region. These faults include the San Andreas, Helendale, Northridge Blind Thrust, San Gabriel, Sierra-Madre, Simi-Santa Rosa, Santa Susana, and Clear Water Faults or Fault Zones, several of which have been included within Earthquake Fault-Rupture Hazard Zones by the state of California. The above nearby active faults are listed within Table 1 of the Initial Preliminary Seismic Design Recommendations. As noted within the above report, the San Andreas Fault (Mojave Section) is the nearest major seismic source for the Los Angeles County portion of the project area.

Liquefaction is the loss of soil strength or stiffness due to a buildup of pore-water pressure during severe ground shaking. Liquefaction is associated primarily with low density, saturated, fine- to medium-grained, cohesionless soil. Effects of liquefaction on ground surface include foundation settlement and reduction in bearing capacity, sand boils, and ground settlement and lateral spreading.

Liquefaction potential is considered low to very low overall due to the significant depth to groundwater and generally medium dense to dense nature of the subsurface soils at most sites. Seismic settlement due to liquefaction is unlikely. However, active creeks such as Anaverde Creek, South Amargosa Creek, and potentially Big Rock Wash, Little Rock Wash, and Mescal Creek require site-specific subsurface investigation and analysis to evaluate liquefaction hazards as mentioned by T. Le and M. Islam (November 18, 2011).

Seismic settlement of dry in-situ soils is expected to be mostly negligible also.

MATERIAL SOURCES

It is anticipated that the HDC segment alignments will be internally balanced with the shallow cuts and fills proposed for grading of the roadway. Fill materials for the overcrossing embankments may be out of balance. Numerous commercial suppliers for sand, gravel, aggregate base, and concrete are located in the High Desert area of San Bernardino and Los Angeles counties. These suppliers and other potential sources of fill materials will be identified

during the future phases of the project. Caltrans must approve the use of any and all material sources proposed.

HAZARDOUS WASTE IMPACT

No hazardous waste materials are anticipated to occur along the project alignment. Should the Environmental Impact Report for the project identify potentially hazardous waste sites, or such sites be encountered during future investigations they will have to be addressed at that time by the District Hazardous Waste Unit. Any proposed remedial measures should be reviewed by the geotechnical design group as they may have potential geotechnical implications. During Caltrans recent preliminary geotechnical investigation, required Gastech GT 402 air monitoring while drilling/sampling detected no measureable levels of methane or combustible hydrocarbons, carbon monoxide, or hydrogen sulfide. Air monitoring was required east of 100th Street East by D07 Hazardous Waste Unit for the HDC exploratory borings (Borings for 170th Street East, 210th Street East, and 240th Street East). Air monitoring would have also been required at Big Rock Wash but that location was not drilled/sampled during the recent study.

CONCLUSIONS AND RECOMMENDATIONS

The geotechnical aspects discussed in this section are preliminary and are based on OGDS1's observations, mapped geologic, and soil conditions. Generally, the site is suitable for construction provided site development is performed in accordance with Caltrans standard design and construction procedures.

Earthwork

Earthwork should be conducted in accordance with the latest edition of Caltrans Standard Specifications (Currently, Section 19 of the 2010 Caltrans Standard Specifications). In areas where compacted fill will be placed, the existing compressible surficial materials including topsoil, loose or soft alluvium or fill soil, dry or saturated soil, and otherwise unsuitable materials must be removed prior to fill placement. A minimum over-excavation of 3 feet below existing grade is recommended within areas to receive fill; the over-excavation should extend horizontally a minimum distance of 3 feet from edges of new fills or structures. Fill placed on sloping ground should be properly keyed and benched into existing ground and placed as specified in 2010 Caltrans Standard Specifications. Over-excavations should be observed by qualified geotechnical personnel to verify that firm and unyielding bottoms are exposed. Over-excavated areas should be cleaned of loose materials and debris, scarified, moisture conditioned, and recompacted as specified by the Caltrans Standard Specifications before receiving fill soils. Compaction testing of soils, collapse potential of soils, and consolidation testing of soils should be completed during the PS & E phase of this project.

Soil Expansion Potential

Based on local As-built and the current field boring logs, the soils encountered along the alignment are predominantly fine to coarse-grained sands with minor amounts of gravel. These

sandy soils are anticipated to be non-expansive or have a very low expansion potential. However, there may be localized, discontinuous layers of clayey soils or lake bed deposits that can possess higher expansion potential. Soil expansion potential should be evaluated during PS&E for the project.

Soil Erosion Potential

Since the native soils are anticipated to be predominantly fine- to coarse-grained sands with minor amounts of gravel, the soils can suffer moderate to severe erosion. However, by incorporating selective grading and adhering to provisions for site drainage, slope planting, and other measures required by Caltrans, the potential for surface soil erosion can be minimized.

Embankment Settlement

Embankments along the HDC roadway are anticipated to range in height up to 21 feet (refer to previously discussed Alignment Alternatives 2 and 3 under Proposed Improvements). Embankment may be as high as 29 ft for SR-14 at S. Amargosa Creek Bridge. Embankments will be constructed with 4H:1V (Horizontal to Vertical) side slopes. Because the subsurface soils are predominantly granular, most of the soils are not expected to undergo consolidation settlement (settlement over long periods of time). However, the soils can undergo "immediate" elastic settlement which usually occurs during earthwork activities and shortly thereafter. For new embankments, elastic settlement is anticipated to be neglegible because of the medium dense to dense nature of the subsurface soils. Settlement magnitudes and time rates of settlement should be verified by exploratory borings, laboratory soil testing, and analysis during the PS&E phase of the project.

Minor cuts ranging from 2 to 15 ft (2H:1V) are proposed in alignment alternative 2. The planned roadway embankment will include 4H:1V (or flatter) side slopes and either 2H:1V or 1.5H:1V slopes at the front of most abutments.

Stability of Slopes

Assuming the earthen embankments will be constructed using compacted fill having a minimum friction angle of 34 degrees and minimum cohesion of 100 psf, slopes up to 45 feet high and with inclinations of 4H:1V or flatter are expected to be globally stable (i.e. minimum factor-of-safety is 1.5 and 1.1 under static and pseudo-static conditions, respectively). Foundation soils (existing below proposed embankments) are anticipated to be stable with respect to global slope stability. The local eastern basin around 240th Street East to the eastern Los Angeles County Line, with finer grained less compacted materials, should be investigated for embankment slope stability and consolidation testing and collapse potential testing should be evaluated during PS&E stage of project.

In addition, using a friction angle and cohesion of 30 degrees and 100 psf, slopes are expected to be surficially stable for excavated embankments in sections requiring over-excavations. Slopes in excavated areas can be deep (up to 45 feet down) and with inclinations of 2H:1V or flatter are expected to be globally stable (i.e. minimum factor-of-safety is 1.5 and 1.1 under static and pseudo-static conditions, respectively). Additional field investigation will be necessary to verify these assumptions.

Earth Retaining Structures

In areas where right-of-way acquisitions may be difficult or where other physical constraints are present (i.e. areas which are environmentally sensitive or where existing structures will remain), cantilevered retaining walls or tieback walls may be required. Walls may be required at various locations throughout the project to widen existing roadways or confine new embankments (to limit the width of embankments). Walls may be required parallel to the mainline embankments, at the end slopes of bridge approach embankments, or along entrance and exit ramps. Based on the subsurface information shown on preliminary field boring logs, standard spread footings are expected to be predominantly suitable for supporting standard Caltrans retaining walls. A minor amount of remedial earthwork below spread footings may be required to remove loose near-surface soils; remedial over-excavations are anticipated to be less than or equal to 3 feet. Exploratory boreholes should be performed along alignments of proposed retaining walls to evaluate the competency of the subsurface soils and verify that pile alternatives are not required. Generally, finer-grained poorer quality foundation soils (often with low apparent densities and consistencies) were observed within Boring A-11-008 at 240 Street East and probably extend from about 224th Street East through the eastern LA County Line. Further soils investigation and laboratory testing is anticipated in this area.

Based on the limited soil information at this preliminary stage, OGDS1 anticipates mostly adequate bearing capacity and lateral resistance parameters for retaining walls using spread footings. All retaining walls will require drainage facilities to minimize hydrostatic pressures, and to prevent potential seeps and piping beneath the retaining wall foundations.

Sound Walls

Sound walls may be required along some portions of the project. Standard spread footings or CIDH piles are anticipated to be suitable for supporting sound walls. However, some degree of remedial grading (over-excavation and re-compaction) may be necessary. Use of standard foundations for sound walls should be confirmed during the PS&E phase of the project. Exploratory boreholes should be performed along the alignments of the proposed sound walls to evaluate the competency of the subsurface soils.

Hazardous Waste Considerations

If for any reason hazardous or toxic materials are believed to exist with the project area, an environmental specialist should be consulted. The presence of aerially-deposited lead, as well as other hazardous and toxic materials, should be evaluated during the PS&E phase of the project.

FUTURE GEOTECHNICAL INVESTIGATIONS

OGDS1 recommends drilling/sampling numerous exploratory borings throughout the project alignment during PS&E phase of the roadway project and individual bridge or wall sites, to investigate site-specific soil properties, groundwater depths, and to collect samples of subsurface soils for laboratory testing. The locations and depths of the borings should be selected once the locations and extent of proposed improvements have been identified and pile type selection decided upon. Soil samples recovered during the future geotechnical field investigations should be tested to determine soil classification, soil shear strength, compressibility characteristics, R-value, compaction characteristics, consolidation, collapse potential, permeability, and corrosion potential, among others.

If you have any questions, please contact Joe Pratt (213) 620-2313 or Shiva Karimi (213) 620-2146 of the Office of Geotechnical Design South 1.

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Attachment A, Initial Preliminary Seismic Design Recommendation

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District 07 Materials Engineer – Kirsten Stahl
District 07 Design – Gordon Leung
District 07 Environmental Planning–Karl Price
HQ Geotechnical Design South-1 – Shiva Karimi
File

References

California Department of Transportation (CALTRANS), September 2003, Corrosion Guidelines, Version 1.0, Division of Engineering Services, Materials Engineering and Testing Services (METS), Corrosion Technology Branch, Sacramento, California, 47 p.

Dibblee, T.W., Jr., May 1997, Geologic Map of the Sleepy Valley and Ritter Ridge 7.5 minute Quadrangles, Los Angeles County, California, Dibblee Geological Foundation Map #DF-66, Scale 1:24,000.

Dibblee, T.W., Jr., April 2001, Geologic Map of the Pacifico Mountain and Palmdale (South ½) 7.5 minute Quadrangles, Los Angeles County, California, Dibblee Geological Foundation Map #DF-76, Scale 1:24,000.

Dibblee, T.W., Jr., February 2002a, Geologic Map of the Juniper Hills 7.5 minute Quadrangle, Los Angeles County, California, Dibblee Geological Foundation Map #DF-79, Scale 1:24,000.

Dibblee, T.W., Jr., February 2002b, Geologic Map of the Valyermo 7.5 minute Quadrangle, Los Angeles County, California, Dibblee Geological Foundation Map #DF-80, Scale 1:24,000.

Dibblee, T.W., Jr., February 2002c, Geologic Map of the Mescal Creek 7.5 minute Quadrangle, Los Angeles County, California, Dibblee Geological Foundation Map #DF-81, Scale 1:24,000.

Halda, T., June 4, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed Little Rock Wash Bridge (New), Br. No. 53-xxxxR/L, Caltrans Memorandum.

Halda, T., June 4, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed 140th Street East OC (New), Br. No. 53-xxxx, Caltrans Memorandum.

Halda, T., June 4, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed Big Rock Wash Bridge (New), Br. No. 53-xxxxR/L, Caltrans Memorandum.

Halda, T., June 4, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed 165th Street East OC (New), Br. No. 53-xxxx, Caltrans Memorandum.

Halda, T., June 4, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed 170th Street East OC (New), Br. No. 53-xxxx, Caltrans Memorandum.

Halda, T., June 4, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed 210th Street East OC (New), Br. No. 53-xxxx, Caltrans Memorandum.

Halda, T., June 4, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed 240th Street East OC (New), Br. No. 53-xxxx, Caltrans Memorandum.

High Desert Corridor Preliminary Geomorphology Report (Draft), November 2011b, prepared by Parsons for Caltrans, 21 p.

High Desert Corridor Preliminary Hydrology and Hydraulics Report (Draft), November 2011a, prepared by Parsons for Caltrans, 21 p.

Islam, M. and Le, T., November 18, 2011, Initial Preliminary Seismic Design Recommendations for the High Desert Corridor Project (Los Angeles County Section: SR-14 to 240th Street East, 07-LA-138; (EA 07-2600U0, EFIS ID: 0712000035, Phase 0), Caltrans Document.

Jennings, C.W., and Strand, R.G., 1969, Geologic Map of California (Olaf P. Jenkins Edition), Los Angeles Sheet, Scale 1:250,000.

Merriam, M., May 3, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed Avenue "S" Undercrossing (Widen), Br. No. 53-1417 – revision, Caltrans Memorandum.

Merriam, M., February 27, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed Anaverde Creek Bridge (Widen), Br. No. 53-1440, CaltranMemorandum.

Merriam, M., February 27, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed Palmdale Blvd Undercrossing (aka 14/138 Separation, Widen), Br. No. 53-1419, Caltrans Memorandum.

Merriam, M., February 27, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed Avenue "Q" Undercrossing (Widen), Br. No. 53-1738, Caltrans Memorandum.

Merriam, M., February 27, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed Technology Drive (aka Ave. "P-8") Undercrossing (Widen), Br. No. 53-2178R/L, Caltrans Memorandum.

Merriam, M., February 27, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed Rancho Vista Blvd (Ave. "P" Undercrossing (Widen), Br. No. 53-2376R/L, Caltrans Memorandum.

Merriam, M., February 27, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed S. Amargosa Creek Bridge (Widen), Br. No. 53-2377R/L, Caltrans Memorandum.

Merriam, M., February 27, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed 10th Street West Undercrossing (Widen), Br. No. 53-2378R/L, Caltrans Memorandum.

Merriam, M., February 27, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed Avenue "O-8" Undercrossing (Widen), Br. No. 53-2379R/L, Caltrans Memorandum.

Merriam, M., February 27, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed Avenue "O" Overcrossing (Widen), Br. No. 53-2179, Caltrans Memorandum.

Merriam, M., February 27, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed Avenue "N" Overcrossing (Widen), Br. No. 53-2222, Caltrans Memorandum.

Merriam, M., and Cook, D., October 12, 2012, Evaluation of Fault Rupture Potential, Avenue "S" Undercrossing (Widen), Br. No. 53-1417, Caltrans Memorandum.

Piratheepan, P., March 23, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed High Desert Corridor Connectors A and B to SR-14 (New), Br. Nos. 53-xxxx, Caltrans Memorandum.

Piratheepan, P., March 23, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed High Desert Corridor Connectors C and D to SR-14 (New), Br. Nos. 53-xxxx, Caltrans Memorandum.

Piratheepan, P., March 23, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed SR-14 to 10th Street East Viaduct (Left, New), Br. No. 53-xxxx, Caltrans Memorandum.

Piratheepan, P., March 23, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed SR-14 to 10th Street East Viaduct (Right, New), Br. No. 53-xxxx, Caltrans Memorandum.

Piratheepan, P., March 7, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed 10th Street East Off-ramp (New) and 10th Street East On-ramp (New), Br. Nos. 53-xxxx, Caltrans Memorandum.

Piratheepan, P., March 5, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed 15th Street East Overcrossing and Undercrossing (New), Br. Nos. 53-xxxx, Caltrans Memorandum.

Piratheepan, P., March 7, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed 20th Street East Overcrossing and Undercrossing (New) Alternatives, Br. Nos. 53-xxxx, Caltrans Memorandum.

Piratheepan, P., March 23, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed 25th Street East Overcrossing and Undercrossing (New) Alternatives, Br. Nos. 53-xxxx, Caltrans Memorandum.

Piratheepan, P., March 23, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed 30th Street East Overcrossing and Undercrossing (New) Alternatives, Br. Nos. 53-xxxx, Caltrans Memorandum.

Piratheepan, P., March 23, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed 40th Street East Overcrossing and Undercrossing (New) Alternatives, Br. Nos. 53-xxxx, Caltrans Memorandum.

Piratheepan, P., March 23, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed 50th Street East Overcrossing and Undercrossing (New) Alternatives, Br. Nos. 53-xxxx, Caltrans Memorandum.

Piratheepan, P., March 23, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed 70th Street East Overcrossing (New), Br. No. 53-xxxx, Caltrans Memorandum.

Piratheepan, P., March 23, 2012, Structure Preliminary Geotechnical Report (SPGR) for Proposed 110th Street East Overcrossing (New), Br. No. 53-xxxx, Caltrans Memorandum.

Rogers, T.H., 1967, Geologic Map of California (Olaf P. Jenkins Edition), San Bernardino Sheet, Scale 1:250,000.